A LEVEL FURTHER MATHEMATICS

Examination Board Specification:　　　　　Edexcel 9FM0

Why Study Mathematics?: For any student who shows a keen interest and a strong understanding of Mathematics, Further Mathematics would make an excellent choice. It takes all the Mathematics studied previously to a higher level; not just making the topics harder but also introducing new and exciting ideas. Students studying Further Mathematics will get to experience one of the true beauties of the subject; the relationships between all aspects of Mathematics. As students get more and more engrossed in the subject, learning more complex aspects, they will begin to see the true scope of what Mathematics is capable of.

Content and Assessment of the Course:

Year 12 and 13 content			
Paper 1	**Further Pure Mathematics 1**	**90 minute examination**	**25%**
This unit includes further exploration of proofs, including proof by induction and contradiction. Alongside this, complex numbers will be introduced, making up the foundation from which further study in to complex numbers is conducted in Paper 2. Students will study 2x2 and 3x3 matrices, including both theoretical manipulations and contextual implications of their use. Alongside these new topics, previous topics will be extended, including algebraic manipulation up to quartic, and use of the sum of integers, squares and cubes. Calculus will be revisited and volumes of revolution will be introduced. Finally, Vectors will be reconsidered and expanded upon.			
Paper 2	**Further Pure Mathematics 2**	**90 minute examination**	**25%**
This unit includes further study of complex number, building on the work on imaginary numbers from paper 1. Alongside this, students will study algebra and functions in more depth, looking at series summations and Maclaurin expansions. Students will also study more Calculus, building on the work they do in their Mathematics A level. They will also study a new way of describing coordinates, called Polar coordinates. Furthermore, they will study hyperbolic functions, which have similar properties to trigonometric functions, and finally they will study differential equations, applying their integrating and differentiating skills through equations.			
Paper 3	**Further Pure Mathematics 3**	**90 minute examination**	**25%**
This is the first of the optional units, and here students will study Calculus further, looking at Taylor series and considering limits, including Leibnitz's theorem and L'Hopital's rule. Alongside this they will expand on their recent study of differential equations by using the Taylor series for find series solutions. Students will also study equations of parabola, hyperbola and ellipses, studying the conic sections and their properties in depth. They will expand upon their knowledge of vectors from the A level course, and study additional numerical methods stemming from the A level course. Finally they will look at inequalities, and encounter new methods to solve these inequalities.			
Paper 4	**Further Mechanics 1**	**90 minute examination**	**25%**
Students will take the work they are doing in their Applied module from A level Mathematics and extend it further. They will consider not just projectiles, but impacts of these projectiles and their resulting motion. Further to this, they will consider the way in which forces interact, and observe the effects through considerations of work, energy and power. Students will also consider elastic motion, such as in strings and springs, alongside energy changes due to this. Finally, they will move in to elastic collisions; in one dimension this will about direct impacts and Newton's law of restitution and in two dimensions this will be considering oblique impacts between a sphere and a surface, and between two spheres.			

As of November 2016, Edexcel offers 10 different ways in which you can achieve the qualification based around different specialisms. The above offered is route A, but we may consider alternative routes, such as route C which is comprised of the first three papers given above, alongside a fourth paper on Further Mechanics 1. There is also the possibility that, given two further mathematics classes, we offer two different compositions for those seeking to study Physics or Computer Science at university.

Additional Information: In Year 13 Students will be sitting a Senior Mathematics Challenge in which they can show case their problem solving skill with a chance to compete nationally. The Senior Mentoring Scheme runs throughout both Year 12 and 13 and students can opt in to this, taking monthly problems and discussing them in groups of students and with teachers once a week. A Mathematics help club will run twice per week at lunchtimes which students are welcome to attend to discuss problems with homework and class work. A teacher will be present, as will able mathematicians from Year 13.

A full specification can be found at:
http://qualifications.pearson.com/content/dam/pdf/A%20Level/Mathematics/2017/specification-and-sample-assesment/a-level-l3-mathematics-specification.pdf

WHSB usually also offers the following enrichment for Sixth Form mathematicians: STEP/MAT club, Project Euler, UKMT Senior Team Mathematics Challenge, Architecture Day, talks from visiting mathematicians, visits to London Universities for Mathematics lectures, a national Cipher Challenge and a national Engineering Challenge. One or two of these events may not be run in some years due to staffing, but many of them will be available.

Entrance Requirements: GCSE grade 8 or 9 in Mathematics.